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Multi-user communication systems have been studied. There are systems in which many simultaneous two-way conversations have common frequencies. The maximum number of such conversations can be computed by a fairly simple linear program.

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June 4, 1991

Dr. Neal D. Glassman
Program Manager
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Dear Neal:

I'm told that I owe you a Final Technical Report on my AFOSR grant, so here it is!
Classes have now ended, and I am now busily working on my new proposal, which you
should have in a week or two.

Best regards,

Robert J. McEliece

Enclosures
RJM/djm

cc: Mary Torres

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Final Technical Report, 1 July 1988–30 September 1990

CODING FOR SPREAD-SPECTRUM CHANNELS
IN THE PRESENCE OF JAMMING
(AFOSR Grant 88-0247)

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Pasadena, CA 91125

Abstract:

The long-term goal of this project is to obtain a basic mathematical understanding of the problems associated with communication in the presence of severe noise, e.g., fading, jamming or interference from other (friendly) signals. Our basic approach has always been to apply the techniques and insights of *information theory* to these problems. In our earliest work in this area, which was devoted solely to the jamming problem, we combined information theory with *game theory*, and obtained many insights about optimal jamming and antijamming strategies for a variety of realistic scenarios (Refs. [1]–[6]). Later, we studied more general models for severe noise (Refs. [7]–[10]), and obtained results which shed considerable light on how best to design communication systems which must function reliably in hostile environments. In our next series of AFOSR-sponsored papers ([11]–[18]), we analyzed the performance of specific classes of error-correcting codes in the presence of severe noise. Finally, in our most recent work ([19]–[22]) we have begun a study of a class of *multi-user* communication systems, systems in which many simultaneous two-way conversations must share a common band of frequencies, and have show that the ultimate limits (measured by the number of conversations per unit of available bandwidth) can, in some cases, be computed by a fairly simple linear program. This work is ongoing, and will form the basis for our proposed FY1992 work.

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(all except [1] acknowledge AFOSR support)

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